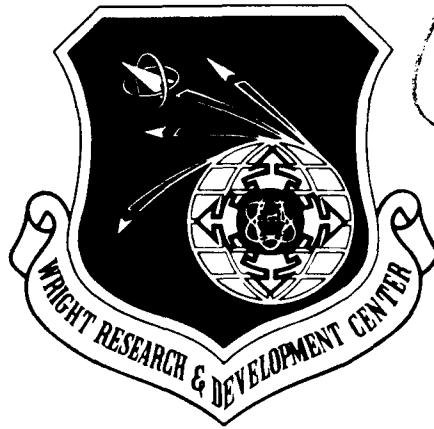


WRDC-TR-90-8007  
Volume V  
Part 43

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INTEGRATED INFORMATION SUPPORT SYSTEM (IISS)  
Volume V - Common Data Model Subsystem  
Part 43 - CDM Compare Utility Development Specification

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Control Data Corporation  
Integration Technology Services  
2970 Presidential Drive  
Fairborn, OH 45324-6209

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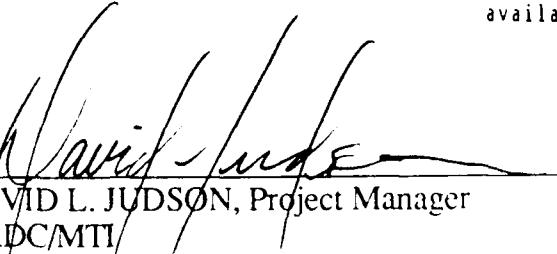
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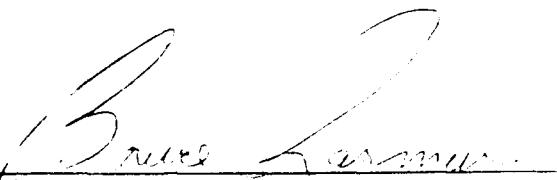
This technical report has been reviewed and is approved for publication.

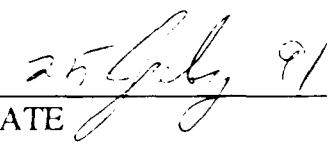
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FOR THE COMMANDER:

  
BRUCE A. RASMUSSEN, Chief  
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## 19. ABSTRACT (Continue on reverse if necessary and identify block number)

This document describes the construction of the Common Data Model (CDM) subsystem's Impact Analysis tool. This tool is used to determine what impact a software change may have on other software modules within the CDM and on the external schemas. Whatever impact occurs is reported on the terminal screen or at a printer device.

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INTEGRATED INFORMATION SUPPORT SYSTEM  
Vol V - Common Data Model Subsystem

## Part 43 - CDM Compare Utility Development Specification

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FOREWORD

This technical report covers work performed under Air Force Contract F33600-87-C-0464, DAPro Project. This contract is sponsored by the Manufacturing Technology Directorate, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Bruce A. Rasmussen, Branch Chief, Integration Technology Division, Manufacturing Technology Directorate, through Mr. David L. Judson, Project Manager. The Prime Contractor was Integration Technology Services, Software Programs Division, of the Control Data Corporation, Dayton, Ohio, under the direction of Mr. W. A. Osborne. The DAPro Project Manager for Control Data Corporation was Mr. Jimmy P. Maxwell.

The DAPro project was created to continue the development, test, and demonstration of the Integrated Information Support System (IISS). The IISS technology work comprises enhancements to IISS software and the establishment and operation of IISS test bed hardware and communications for developers and users.

The following list names the Control Data Corporation subcontractors and their contributing activities:

<u>SUBCONTRACTOR</u>	<u>ROLE</u>
Control Data Corporation	Responsible for the overall Common Data Model design development and implementation, IISS integration and test, and technology transfer of IISS.
D. Appleton Company	Responsible for providing software information services for the Common Data Model and IDEF1X integration methodology.
ONTEK	Responsible for defining and testing a representative integrated system base in Artificial Intelligence techniques to establish fitness for use.
Simpact Corporation	Responsible for Communication development.

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30 September 1990

Structural Dynamics  
Research Corporation

Responsible for User Interfaces,  
Virtual Terminal Interface, and Network  
Transaction Manager design,  
development, implementation, and  
support.

Arizona State University

Responsible for test bed operations  
and support.

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SECTION 1

SCOPE

1.1 Identification

This specification establishes the detailed requirements for performance, design, test, and qualification of a computer program identified as the CDM Compare Utility of IISS.

Please refer to the Software Availability Bulletin, Volume III, Part 16, CI# SAB620326000, for current IISS software and documentation availability.

1.2 Functional Summary

The CDM Compare Utility is used to compare two versions of a CDM and report differences in the internal, conceptual and external schemas as well as the conceptual-internal, conceptual-external and complex schema mappings.

## SECTION 2

### DOCUMENTS

#### 2.1 Reference Documents

- [1] Systran, ICAM Documentation Standards, IDS150120000C, 15 September 1983.
- [2] D.Appleton Company, CDM Administrator's Manual, UM 620341000, 31 March 1988.
- [3] D.Appleton Company, CDM1, An IDEF1 Model of the Common Data Model, CCS620141000, 15 May 1985.
- [4] Control Data Corporation, Neutral Data Definition Language User's Guide, 31 March 1988.
- [5] C. J. Date, An Introduction to Database Systems, Addison-Wesley Publishing Company, Inc, 1977.
- [6] IBM, DATABASE 2 Reference release 1.0, IBM, December 1984.
- [7] Cincom Systems, TOTAL Database Administration Reference Manual, release 8.1 1978, Cincom Systems.

#### 2.2 Terms and Abbreviations

Application Process: (AP), a cohesive unit of software that can be initiated as a unit to perform some function or functions.

Common Data Model: (CDM), IISS subsystem that describes common data of an enterprise and includes conceptual, external and internal schemas and schema transformation operators.

Common Data Model Administrator: (CDMA), the person or group of persons responsible for creating and maintaining an enterprise's Common Data Model. The CDMA manages the common data rather than managing applications that access data.

Common Data Model Processor: (CDMP), a component of the Common Data Model subsystem which is the distributed database manager of the IISS.

Conceptual Schema: (CS), the standard definition used for all data in the enterprise. It is based on IDEF1 information modeling.

External Schema: (ES), an application's view of the CDM's conceptual schema.

Integrated Information Support System: (IISS), a computing environment used to investigate, demonstrate, test the concepts and produce application for information management and information integration in the context of Aerospace Manufacturing. The IISS addresses the problems of integration of data resident on heterogeneous data bases supported by heterogeneous computers interconnected via a Local Area Network.

Internal Schema: (IS), the definition of the internal model, the storage structure definition, which specifies how the physical data are stored and how they can be accessed. It is represented in terms of the physical database components, including record types and inter-record relationships.

Neutral Data Definition Language: (NDDL), A language used to manipulate and populate information in the Common Data Model (CDM) or IISS System Database.

Neutral Data Manipulation Language: (NDML), A language developed by the IISS project to provide uniform access to common data, regardless of database manager or distribution criteria. It provides distributed retrieval and single node update.

Presentation Schema: (PS), The totality of the form fields in an application which are targets of data derivative from the common data.

SECTION 3  
REQUIREMENTS

3.1 Computer Program Definition

The CDM Compare Utility is used to report the differences between two versions of a CDM. Comparisons will be made on the objects within the internal, conceptual and external schemas as well as the objects in the conceptual-internal, conceptual-external schema mappings and complex mappings.

The CDM Compare Utility is composed of three parts or phases. The extract phase will obtain the pertinent information from a CDM and save the information in a file. This data extraction must be done for each version of the CDM. The compare phase will perform a comparison of the information obtained from the extract phase. The report phase displays the results of the comparison.

It is a basic assumption of this specification that both versions of the CDM will reside on the same host. Further, this implementation will be done on a VAX system. Work files identified as being dynamically created during the execution of this facility will be created with allowances for portability to other hosts.

3.1.1 System Capacities

The System capacities of the CDM Compare have not been determined.

3.1.2 Interface Requirements

The CDM Compare Utility is constrained to query database tables of the CDM and to format and present its reports via the User Interface Report Writer. NDML will be used to obtain the required information from the CDM during the extract phase. The user must be able to access the IISS environments required to access each version of the CDM.

3.1.2.1 Interface Block Diagram

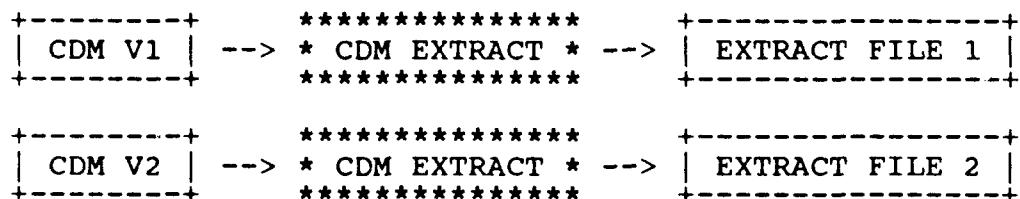


Figure 3-1 Extract Phase



Figure 3-2 Compare Phase

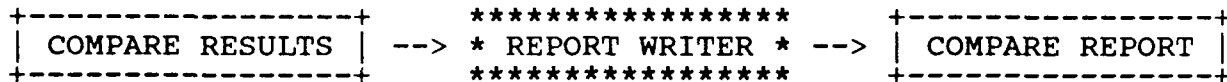


Figure 3-3 Report Phase

### 3.1.2.2 Detailed Interface Definition

The CDM Extract is accessed through the IISS function screen. At this step the user specifies the schemas and mappings to be compared and the name of the output data file. The information about each version of the CDM must be extracted separately as described in section 3.2. The result of a CDM Extract is a data file.

The CDM Compare is also accessed through the IISS function screen. The user specifies the names of the files containing the results of the CDM extract operation.

The CDM Compare Report is accessed through the IISS function screen. The user specifies the output medium. The report is presented via the Report Writer and may appear on any device supported by it.

## 3.2 Detailed Functional Requirements

The CDM Compare Utility is used to report the differences between two versions of a CDM. Comparisons will be made on the objects within the internal, conceptual and external schemas as well as the objects in the conceptual-internal, conceptual-external schema mappings and complex mappings as selected by the user.

The CDM Compare Utility is composed of three parts or phases. The extract phase will obtain the pertinent information from a CDM and save the information in a file. This data extraction must be done for each CDM. The compare phase will perform a comparison of the information obtained from the extract phase. The report phase presents the results of the comparison to a device specified by the user.

### 3.2.1 CDM Extract Phase

This part of the CDM Compare Utility obtains information from the two versions of the CDM, builds flattened data records and writes the records to a data file which will be used as input to the comparison phase of the CDM Compare utility. In order to

obtain the information from a given CDM, the user must enter the IISS environment which contains that CDM. This is required since an application program using NDML may access at most one version of a CDM at a time and there can only be one CDM per IISS environment.

### 3.2.1.1 Inputs

When the CDM Extract phase is selected from the IISS function screen, the user will be presented with the form shown in figure 3-4. The CDM Version Identifier field is a ten character field used to identify the CDM during the comparison process. The Output Data File Name is a forty character field used to name the output data file. The objects to be compared are selected by placing an "X" by the desired objects.

```
+-----+
          INTEGRATED INFORMATION SUPPORT SYSTEM
          CDM COMPARE UTILITY
          ** EXTRACT PHASE **

          CDM Version Identifier: _____
          Output Data File Name: _____
          Place an "X" by each object to be compared
          and press <enter> when your selections are
          complete.

          _Internal Schema      _Conceptual-Internal Schema Mappings
          _Conceptual Schema    _Conceptual-External Schema Mappings
          _External Schema       _Complex Mapping

          Msg: 0                      application
+-----+
```

Figure 3-4 Extract Phase Input Screen

### 3.2.1.2 Processing

The CDM Extract will create a data file with the name specified by the user. The tables for those schemas and mappings selected will be read and the data written to the data file. The processing required to build the data records for each object is described below. The "Using" specification used in the processing definitions is the value in the "where" predicate of an NDML statement.

Conceptual Schema

**Model definition:**

Step 1. Using: N/A  
Select: model\_name  
From: Model\_Class

**Entity Class, Key Definition:**

Step 1. Using : N/A  
Select: ec\_no, model\_no  
From: Entity\_Class

Step 2. Using: ec\_no, model\_no  
Select: ec\_name, model\_name, ec\_name\_type,  
kc\_name, tag\_name  
From: Entity\_Name, Model\_Class, Key\_Class  
Attribute\_Use\_C1

**Entity Class, Owned Attributes:**

Step 1. Using: N/A  
Select: ec\_no, model\_no  
From: Entity\_Class

Step 2. Using: model\_no, ec\_no  
Select: model\_name, ec\_name, ac\_no  
From: Model\_Class, Entity\_Class,  
Owned\_Attribute

Step 3. Using: ac\_no  
Select: ac\_name  
From: Attribute\_Name

**Entity Class, Inherited Attributes:**

Step 1. Using: N/A  
Select: model\_no, ec\_no  
From: Entity\_Class

Step 2. Using: model\_no, ec\_no  
Select: model\_name, ec\_name, tag\_no,  
tag\_name, ac\_no  
From: Model\_Class, Entity\_Name,  
Attribute\_Use\_C1

Step 3. Using: tag\_no, ac\_no  
Select: rc\_no, ac\_name  
From: Inherited\_Att\_Use, Attribute\_Name

**Entity Class, Independent Entity Relation Class**

Step 1. Using: N/A  
Select: model\_no, ec\_no  
From: Entity\_Class

**Step 2.** Using: model\_no, ec\_no  
Select: model\_name, ec\_name, rc\_name,  
From: Model\_Class, Entity\_Name,  
LINK\_RELATION

Entity Class, Dependent Entity Relation Class:

**Step 1.** Using: N/A  
Select: model\_no, ec\_no  
From: Entity\_Class

**Step 2.** Using: model\_no, ec\_no  
Select: model\_name, ec\_name, rc\_name,  
From: Model\_Class, Entity\_Name,  
LINK\_RELATION

Relation Class, Relation Definition:

**Step 1.** Using: REL\_TYPE = "LINK"  
Select: RC\_NO  
From: RELATION\_CLASS

**Step 2.** Using: RC\_NO  
Select: ind\_ec\_no, rc\_name, dep\_ec\_no,  
no\_Ind\_ent, min\_no\_dep\_ent,  
max\_no\_dep\_ent  
From: LINK\_RELATION

**Step 3.** Using: ind\_ec\_no, dep\_ec\_no  
Select: ec\_name(ind), ec\_name(dep),  
model\_no  
From: Entity\_Name, Entity\_Class

**Step 4.** Using: ind\_ec\_no, model\_no  
Select: kc\_name, kc\_no, model\_name  
From: Key\_Class, model\_class

**Step 5.** Using: kc\_no  
Select: tag\_name(ind), tag\_name(dep)  
From: Attribute\_Use\_Cl

Relation Class, Keyword Definition

**Step 1.** Using: REL\_TYPE = "LINK"  
Select: RC\_NO  
From: RELATION\_CLASS

**Step 2.** Using: RC\_NO  
Select: rc\_name, ind\_ec\_no  
From: LINK\_RELATION

**Step 3.** Using: ind\_ec\_no, rc\_no  
Select: model\_no, kw\_no  
From: Entity\_Class, Rc\_Keyword

**Step 4.** Using: model\_no, kw\_no  
Select: model\_name, Keyword  
From: Model\_Class, Keyword

Domain Definition - Data Type:

Step 1. Using: N/A  
Select: domain\_no, domain\_name  
From: Domain\_Class

Step 2. Using: domain\_no  
Select: data\_type\_name, max\_size,  
no\_of\_decimals, data\_type\_ind  
From: User\_Def\_Data\_Type

Domain Definition, Range:

Step 1. Using: N/A  
Select: domain\_no, domain\_name  
From: Domain\_Class

Step 2. Using: domain\_no  
Select: begin\_value, end\_value  
From: Domain\_Range

Domain Definition, Values:

Step 1. Using: N/A  
Select: domain\_no, domain\_name  
From: Domain\_Class

Step 2. Using: domain\_no  
Select: specific\_value  
From: Domain\_Value

External Schema

User Views, View Definitions

Step 1. Using: N/A  
Select: view\_no, sec\_id  
From: Sec

Step 2. Using: view\_no  
Select: di\_id, data\_type\_name  
From: Data\_Item

INTERNAL SCHEMA

Data Base Definition:

Step 1. Using: N/A  
Select: db\_id, db\_name, host\_id, dbms\_name,  
null\_value  
From: Data\_Base

Step 2. Using: db\_id  
Select: schema\_name, subschema\_name,  
db\_location  
From: Schema\_Names

Data Base Definition, Area Assignments

Step 1. Using: N/A  
Select: db\_id, db\_name  
From: Data\_Base

Step 2. Using: db\_id  
Select: area\_id, rt\_id  
From: Data\_Base\_Area, Db\_Area\_Assignment

Data Base Definition, Record Type Area Assignments

Step 1. Using: N/A  
Select: db\_id, db\_name  
From: Data\_Base

Step 2. using: db\_id  
select: rt\_id  
from: Record\_Type

Step 3. Using: rt\_id  
Select: area\_id  
From: Db\_Area\_Assignment

Data Base Definition, Record Type Data Field Definition

Step 1. Using: N/A  
Select: db\_id, db\_name  
From: Data\_Base

Step 2. Using: db\_id  
Select: rt\_id  
From: Record\_Type

Step 3. Using: rt\_id  
Select: df\_id, rec\_seq\_no, rec\_key\_code,  
occurs, dbms\_access,  
index\_indicator  
From: Data\_Field

Step 4. Using: df\_no  
Select: data\_type, redef\_df\_no, component\_of\_df,  
occ\_depend\_df\_no, index\_by\_df\_no,  
filler\_size  
From: Elementary\_Data\_Field,  
Data\_Field\_Redefinition,  
Component\_Data\_Field,  
Repeating\_Df\_Occ\_Counter, Index\_Df,  
Data\_Field\_Filler

Step 5. Using: redef\_field\_no  
Select: df\_id  
From: Data\_Field

Step 6. Using: component\_of\_df  
Select: df\_id  
From: Data\_Field

Step 7. Using: occ\_depend\_df\_no  
Select: df\_id  
From: Data\_Field

Step 8. Using: index\_by\_df\_no  
Select: df\_id  
From: Data\_Field

Data Base Definition, Record Type Record Set Definition:

Step 1. Using: N/A  
Select: db\_id, db\_name  
From: Data\_Base

Step 2. Using: db\_id  
Select: set\_id, rt\_id\_of\_owner, total\_num\_mem  
From: Record\_Set

Step 3. Using: set\_id  
Select: rt\_id\_of\_member, req\_mem\_id  
From: Set\_Type\_Member

Step 4. Using: rt\_id\_of\_member  
Select: df\_id, linkage\_type  
From: Df\_Set\_Linkage

Data Base Definition, PSB Definition:

Step 1. Using: N/A  
Select: db\_id, db\_name  
From: Data\_Base

Step 2. Using: db\_id  
Select: psb\_name, pcb\_seq\_no, key\_feedback\_len  
From: Psb\_Pcb

Step 3. Using: psb\_name  
Select: host\_id  
From: Psb

Conceptual - External Schema Mappings

Project Data Item Mapping

Step 1. Using: N/A  
Select: view\_no, view\_id  
From: User\_View

Step 2. Using: view\_no  
Select: di\_id  
From: Data\_Item

Step 3. Using: di\_id  
Select: tag\_no, prim\_secondary  
From: Project\_data\_item

Step 4. Using: tag\_no  
Select: tag\_name, ec\_no  
From: Attribute\_Use\_Cl

Step 5. Using: ec\_no  
Select: ec\_name  
From: Entity\_Name

**View - Entity Class Mapping**

Step 1. Using: N/A  
Select: view\_no, view\_id  
From: User\_view

Step 2. Using: view\_no  
Select: ec\_no  
From: View\_Ec\_Xref

Step 3. Using: ec\_no  
Select: ec\_name  
From: Entity\_Name

**Complex Mapping:**

Step 1. Using: N/A  
Select: view\_no, view\_id  
From: User\_View

Step 2. Using: view\_no  
Select: di\_id, di\_no  
From: Data\_Item

Step 3. Using: di\_no  
Select: mod\_id, parm\_id, di\_alg\_use\_code,  
di\_mod\_instance  
From: Di\_Parm

**Complex Mappings**

**Module Definition**

Step 1. Using: N/A  
Select: mod\_id, lang\_name, latest\_rev\_date,  
status\_ind  
From: Software\_Module

**Module Parameter Definition**

Step 1. Using: mod\_id  
Select: parm\_id, parm\_name, data\_type\_name  
From: Module\_parameter

**Module Parameter Specification - (If Attribute)**

Step 2. Using: parm\_id  
Select: tag\_no, auc\_alg\_use\_code,  
auc\_mod\_instance  
From: Auc\_Parm

**Step 3.** Using: tag\_no  
Select: tag\_name, ec\_no  
From: Attribute\_Use\_C1

**Step 4.** Using: ec\_no  
Select: ec\_name  
From: Entity\_Name

**Module Parameter Specification - (If Constant)**

**Step 2.** Using: parm\_id  
Select: constant\_value, const\_alg\_use\_code,  
const\_mod\_instance  
From: Const\_Parm

**Step 3.** Using: parm\_id  
Select: rt\_no, rt\_alg\_use\_code,  
rt\_mod\_instance  
From: rt\_parm

**Module Parameter Specification - (If Data Field)**

**Step 2.** Using: parm\_id  
Select: df\_no, df\_alg\_use\_code,  
df\_mod\_instance  
From: Df\_Parm

**Step 3.** Using: df\_no  
Select: df\_id, rt\_id, db\_id  
From: Data\_Field

**Step 4.** Using: db\_id  
Select: db\_name  
From: Data\_Base

**Module Parameter Specification - (If Data Item)**

**Step 2.** Using: parm\_id  
Select: di\_no, di\_alg\_use\_code,  
di\_mod\_instance  
From: Di\_Parm

**Step 3.** Using: di\_no  
Select: di\_id, view\_no  
From: Data\_Item

**Step 4.** Using: view\_no  
Select: view\_id  
From: User\_View

**Conceptual - Internal Schema Mappings**

**Attribute Class, Record Set Mapping**

**Step 1.** Using: N/A  
Select: db\_id, tag\_no, pref\_no, map\_type  
From: Auc\_Is\_Mapping

Step 2. Using: db\_id, tag\_no  
Select: db\_name, set\_id, auc\_value, tag\_name,  
ec\_no  
From: Data\_Base, Auc\_St\_Mapping,  
Attribute\_Use\_C1

Step 3. Using: ec\_no  
Select: ec\_name, model\_no  
From: Entity\_Name

Step 4. Using: model\_no  
Select: model\_name  
From: Model\_Class

#### Attribute Class, Data Field Mapping

Step 1. Using: N/A  
Select: db\_id, rt\_id, tag\_no, pref\_no, map\_type  
From: Auc\_Is\_Mapping

Step 2. Using: db\_id, tag\_no  
Select: db\_name, ec\_no, tag\_name,  
From: Data\_Base, Attribute\_Use\_C1

Step 3. Using: ec\_no, rt\_id  
Select: df\_id, ec\_name, model\_no  
From: Entity\_Name, Project\_Data\_Field

Step 4. Using: model\_no  
Select: model\_name  
From: Model\_Class

#### Attribute Class, Complex Mapping

Step 1. Using: N/A  
Select: db\_id, rt\_id, tag\_no, pref\_no, map\_type  
From: Auc\_Is\_Mapping

Step 2. Using: db\_id, tag\_no  
Select: db\_name, ec\_no, tag\_name, mod\_id,  
parm\_id  
From: Data\_Base, Auc\_Parm, Attribute\_Use\_C1

Step 3. Using: ec\_no, mod\_id, parm\_id  
Select: ec\_name, model\_no, parm\_name  
From: Entity\_Name

Step 4. Using: model\_no  
Select: model\_name  
From: Model\_Class

#### Relation Class, Record Set Mapping

Step 1. Using: N/A  
Select: rc\_name, ind\_ec\_no, dep\_ec\_no, rc\_no  
From: LINK\_RELATION

Step 2. Using: ind\_ec\_no, dep\_ec\_no, rc\_no  
Select: ec\_name(dep), ec\_name(dep), model\_no,  
db\_id, set\_id, rt\_id  
From: Entity\_Class, Rc\_Based\_Rec\_Set

Step 3. Using: db\_id, model\_no  
Select: db\_name, model\_name  
From: Data\_Base, Model\_Class

#### Entity\_Class, Partition Mapping

Step 1. Using: N/A  
Select: ec\_no, model\_no  
From: Entity\_Class

Step 2. Using: ec\_no, model\_no  
Select: ec\_name, model\_name, rt\_no, hp\_no  
From: Entity\_Name, Model\_Class,  
Horizontal\_Partition

Step 3. Using: rt\_no  
Select: db\_id, rt\_id  
From: Record\_Type

Step 4. Using: db\_id  
Select: db\_name  
From: Data\_Base

#### Entity Class, Record Type, Union Discriminator

Step 1. Using: N/A  
Select: ec\_no, model\_no  
From: Entity\_Class

Step 2. Using: ec\_no, model\_no  
Select: ec\_name, model\_name, db\_id, rt\_id,  
df\_id, union\_value, comparison\_value  
From: Entity\_Name, Model\_Class, Ecrtud

Step 3. Using: db\_id  
Select: db\_name  
From: Data\_Base

#### 3.2.1.3 Outputs

The output from the CDM Extract will be a data file with records of the following general format.

CDM id	schema	category	level	base data	attr. data
--------	--------	----------	-------	-----------	------------

Figure 3-5 Record Format

Each field is defined as follows:

CDM Version Id - the 10 character name provided by the user to identify the CDM definition.

**schema** - a 4 character designation used to identify the type of object contained in the data record.

"0003" - Internal Schema  
"0001" - External Schema  
"0002" - External Schema  
"0006" - Conceptual-Internal Schema Mapping  
"0004" - Conceptual-External Schema Mapping  
"0005" - Complex Mapping

**category** - a 4 byte numeric field identifying a class within the schema. An example would be the category Entity Class within the Conceptual Schema. The schema identifier above would be "CS" and the category identifier would be a number representing Entity.

**level** - a 4 byte numeric field identifying the level within the schema category. An example would be the level "owned attributes" belonging to the category Entity Class within the schema Conceptual Schema. The level identifier would be a number identifying "owned attributes".

**base data** - a field or combination of fields which uniquely identifies a schema.category.level occurrence. The base data is the fundamental unit of comparison for determining whether a schema.category.level occurrence exists in one CDM and not in another. To check for the occurrence of an "owned attribute" for an Entity Class definition, the base data would be composed of "Model Name, Entity Class Name, Attribute Name". If a record with the corresponding base data value does not exist in the other CDM extract data file, then it can be said that this occurrence is missing from the second CDM.

**attribute data** - an attribute or combination of attributes which belong to the schema.category.level named by the base data. The attribute data field is the unit of comparison which determines whether a schema.category.level occurrence in one CDM is different than the same occurrence in another CDM.

The base and attribute data areas are of variable length in general. However, within a particular schema.category.level they are fixed length. Appendix A contains the detailed definition for each possible data record.

### **3.2.2 CDM Compare Phase**

This part of the CDM Compare Utility performs a comparison on the two files created from the extract phase. The output from the compare populates the results table. This table contains all the results of the compare.

### 3.2.2.1 Inputs

When the compare phase is selected from the IISS function screen, the user will be presented with the form shown in figure 3-6. The user must enter the extract file names that were supplied during the extract phase of the utility.

INTEGRATED INFORMATION SUPPORT SYSTEM	
CDM COMPARE UTILITY	
** COMPARE PHASE **	
Enter the names of the extract files to be compared and press <enter>.	
Extract File 1:	<input type="text"/>
Extract File 2:	<input type="text"/>
Msg: 0	application

Figure 3-6 Compare Phase Input Screen

### 3.2.2.2 Processing

The extract files will be sorted, using a system sort, in ascending sequence for the length of the entire data record. The differences between the two versions of the CDM will be identified by comparing the base data and attribute data within a given schema.category.level. Definitions missing or different in either version of the CDM will be reported.

### 3.2.2.3 Outputs

The output from the compare phase will be data which populates the results table Compare\_Results. The data which will go into the results table will be: CDM version, schema id, category, level, base data and description of the difference for this base data occurrence.

### 3.2.3 CDM Compare Report Phase

The report phase retrieves the comparison results from the Compare\_Results table and outputs the results through the Report Writer to any device supported by the Report Writer. The Compare\_Results table must be created prior to using the CDM Compare utility the first time. The table should remain available.

### 3.2.3.1 Input

When the report phase is selected from the IISS Function Screen, the user will be presented with the form shown in Figure 3-7. The user will enter the output desired output device name. The report phase also uses as input the results table populated during the compare phase.

```
+-----+
          INTEGRATED INFORMATION SUPPORT SYSTEM
          CDM COMPARE UTILITY
          ** REPORT PHASE **

          Enter the output medium and press <enter>.

          Output Medium: _____
Msg: 0                                     application
```

Figure 3-7 Report Phase Input Screen

### 3.2.3.2 Processing

The Compare\_Results table will be read, using NDML, selecting schema, category, level, base data and description for display.

### 3.2.3.3 Output

The results report will be presented to the user as shown in Figure 3-8.

```
+-----+
          CDM COMPARE REPORT
          Conceptual Schema
          Entity Class - Owned Attributes
          Item: model_name.ec_name.ac_name1
          Reason: not defined for CDM 2
          Item : model_name.ec_name.ac_name2
          Reason: different for CDM 2
Msg: 0                                     application
```

Figure 3-8 Report Phase Output Display

### 3.3 Performance Requirements

#### 3.3.1 Programming Methods

The programs consist of the functions in section 3.2 which compare an object in one version of a CDM with another. The programs also consist of a report section which formats and presents the results of the CDM Compare.

#### 3.3.2 Modification Requirements

This system makes use of the structure of the CDM. When the CDM is modified, this development specification should be reviewed to determine if the CDM Compare requires modification.

### 3.4 Database Requirements

The CDM Compare makes use of the CDM database. Queries are made against the following tables: Domain\_Class, Dbms, Host, User\_Def\_Data\_Type, User\_View, Data\_Item, Attribute\_Class, Attribute\_Name, Entity\_Class, Entity\_Name, Relation\_Class, LINK\_RELATION, Data\_Base, Record\_Type, Data\_Field, Record\_Set, Ecrtud, Horizontal\_Part, Project\_Data\_Field, Auc\_St\_Mapping, Rc\_Based\_Rec\_Set, Project\_Data\_Item, and Model\_Class, Key\_Class, Attribute\_Use\_C1, Owned\_Attribute, Inherited\_Att\_Use, Rc\_Keyword, Keyword, Domain\_Range, Domain\_Value, User\_View, Data\_Item, Schema\_Names, Data\_Base\_Assignment, Elementary\_Data\_Field, Index\_Df, Data\_Field\_Redefinition, Component\_Data\_Field, Repeating\_Df\_Occ\_Counter, Data\_Field\_Filler, Set\_type\_Member, Df\_Set\_Linkage, Psb\_Pcb, Psb, Di\_Parm, Software\_Module, Module\_Parameter, Auc\_Parm, Const\_Parm, DF\_Parm, Auc\_Is\_Mapping.

#### SECTION 4

#### QUALITY ASSURANCE PROVISIONS

##### 4.1 Introduction and Definitions

"Testing" is a systematic process that may be preplanned and explicitly stated. Test techniques and procedures may be defined in advance and a sequence of test steps may be specified. "Debugging" is the process of isolation and correction of the cause of an error.

"Antibugging" is defined as the philosophy of writing programs in such a way as to make bugs less likely to occur and when they do occur, to make them more noticeable to the programmer and the user. In other words, as much error checking as is practical and possible in each routine should be performed.

##### 4.2 Computer Programming Test and Evaluation

The quality assurance provisions for test consists of the normal testing techniques that are accomplished during the construction process. They consist of design and code walk-throughs, unit testing, and integration testing. These tests are performed by the design team. Structured design, design walk-through and the incorporation of "antibugging" facilitate this testing by exposing and addressing problem areas before they become coded "bugs".

The test will consist of making a copy of a CDM (model only) and adding, modifying or deleting one or more of each of the objects listed in section 3.2. Next the CDM compare will be run. The report should list exactly those objects added, modified or deleted.

SECTION 5

PREPARATION FOR DELIVERY

The implementation site for the constructed software is the Integrated Information Support System (IISS) Test Bed site. Each CPCI release is clearly identified and includes instructions on procedures to be followed for installation of the release. Integration with the other IISS CPCI's will be done on the IISS test bed on a scheduled basis. Delivery of this software will be on a media which is compatible with the IISS Test Bed.

APPENDIX A

EXTRACT DATA FILE RECORD DEFINITIONS

This appendix contains the individual record definitions for the records created during the extract phase of the CDM Compare utility.

A.1 CONCEPTUAL SCHEMA (schema = "0001")

A.1.1 Category 1 - Model Definition

A.1.1.1 Level 1 Description: Model Definition  
Base data: model\_name  
Attribute data: none

A.1.2 Category 2 - Entity Class

A.1.2.1 Level 1 Description: Key Definition  
Base data: model\_name, ec\_name, kc\_name  
Attribute data: tag\_name

A.1.2.2 Level 2 Description: Owned Attributes  
Base data: model\_name, ec\_name, ac\_name  
Attribute data: none

A.1.2.3 Level 3 Description: Inherited Attributes  
Base data: model\_name, ec\_name, tag\_name  
Attribute data: ac\_name

A.1.2.4 Level 4 Description: Entity as Independent Entity in  
LINK\_RELATION Definition  
Base data: model\_name, ec\_name, rc\_name  
Attribute data: none

A.1.2.5 Level 5 Description: Entity as Dependent Entity in  
LINK\_RELATION Definition  
Base data: model\_name, ec\_name, rc\_name  
Attribute data: none

A.1.3 Category 3 - Relation Class

A.1.3.1 Level 1 Description: Relation Definition  
Base data: model\_name  
Attribute data: ec\_name(ind), ec\_name(dep),  
no\_ind\_ent, min\_no\_dep\_ent,  
max\_no\_dep\_ent

A.1.3.2 Level 2 Description: relation keywords  
Base data: model\_name, rc\_name, keyword  
Attribute data: none

A.1.3.3 Level 3 Description: migrating keys  
Base data: model\_name, rc\_name,  
kc\_name, tag\_name  
Attribute data: none

A.1.4 Category 4 - Attribute Class

A.1.4.1 Level 1 Description: Attribute Definition  
Base data: model\_name, ac\_name  
Attribute data: ac\_name\_type, domain\_name, keyword

A.1.4.2 Level 2 Description: Attribute keywords  
Base data: model\_name, ac\_name, keyword  
Attribute data: none

A.1.5 Category 5 - Domains

A.1.5.1 Level 1 Description: Data Type  
Base data: domain\_name  
Attribute data: data\_type\_name, max\_size, no\_of\_decimals, data\_type\_ind

A.1.5.2 Level 2 Description: Domain Range  
Base data: domain\_name  
Attribute data: begin\_value, end\_value

A.1.5.3 Level 3 Description: Domain Value  
Base data: domain\_name  
Attribute data: specific\_value

A.2 EXTERNAL SCHEMA (schema = "0002")

A.2.1 Category 1 - User Views

A.2.1.1 Level 1 Description: User View Definition  
Base data: view\_id  
Attribute data: di\_id, data\_type\_name

A.3 INTERNAL SCHEMA (schema = "0003")

A.3.1 Category 1 - Data Base Definition

A.3.1.1 Level 1 Description: Data Base Environment  
Base data: db\_name  
Attribute data: dbms\_name, host\_id, null\_value schema\_name, subschema\_name, db\_location

A.3.1.2 Level 2 Description: Area Assignments  
Base data: db\_name, area\_id  
Attribute data: rt\_id

A.3.1.3 Level 3 Description: Record Type Area Assignments  
Base data: db\_name, rt\_id  
Attribute data: area\_id

A.3.1.4 Level 4 Description: Record Type Data Field Definitions  
Base data: db\_name, rt\_id, df\_id  
Attribute data: rec\_seq\_no, rec\_key\_code, occurs, dbms\_access, index\_indicator, data\_type\_name, redef\_df\_no(name), component\_of\_df(name), occ\_depend\_df\_no(name), index\_by\_df\_name, index\_of\_df\_name, filler\_size

A.3.1.5 Level 5 Description: Record type data field redefined by  
Base data: db\_name, rt\_id, df\_id  
Attribute data: redef\_df\_name

A.3.1.6 Level 6 Description: Record type data field composed of  
Base data: db\_name, rt\_id, df\_id  
Attribute data: composed\_of\_name

A.3.1.7 Level 7 Description: Record Set Definition  
Base data: db\_name, set\_id, rt\_id\_of\_owner, Attribute data: total\_num\_mem, req\_mem\_ind, rt\_id\_of\_member, df\_id, linkage\_type

A.3.1.8 Level 8 Description: Data Base PSB Definition  
Base data: db\_name, psb\_name  
Attribute data: pcb\_seq\_no, key\_feedback\_len, host\_id

#### A.4 CONCEPTUAL - EXTERNAL SCHEMA MAPPINGS (schema = "0004")

##### A.4.1 Category 1 - External To Conceptual Schema Mappings

A.4.1.1 Level 1 Description: Project Data Item Mapping  
Base data: view\_id, di\_id  
Attribute data: ec\_name, tag\_name, prim\_secondary

A.4.1.2 Level 2 Description: View - Relation Class Mapping  
Base data: view\_id, rc\_name  
Attribute data: ec\_name(ind), ec\_name(dep)

A.4.1.3 Level 3 Description: Complex Mapping  
Base data: view\_id, di\_id  
Attribute data: mod\_id, parm\_id, di\_alg\_use\_code, di\_mod\_instance

#### A.5 COMPLEX MAPPING (schema = "0005")

##### A.5.1 Category 1 - Definitions

A.5.1.1 Level 1 Description: Module Definition  
Base data: mod\_id  
Attribute data: language, latest\_rev\_date, status\_ind

A.5.1.2 Level 2 Description: Parameter Definition  
Base data: mod\_id, parm\_name  
Attribute data: parm\_id, data\_type\_name

A.5.1.3 Level 3 Description: Parameter Specification  
Base data: mod\_id, parm\_name  
Attribute data:  
if attribute:  
    ec\_name, tag\_name,  
    auc\_alg\_use\_code,  
    auc\_mod\_instance  
if constant:  
    constant\_value,  
    const\_alg\_use\_code,  
    const\_mod\_instance  
if record type:  
    db\_name, rt\_id,  
    rt\_alg\_use\_code,  
    rt\_mod\_instance  
if data field:  
    db\_name, rt\_id, df\_id,  
    df\_alg\_use\_code,  
    df\_mod\_instance  
if data item:  
    view\_id, di\_id,  
    di\_alg\_use\_code,  
    di\_mod\_instance

## A.6 CONCEPTUAL - INTERNAL SCHEMA MAPPINGS (schema = "0006")

### A.6.1 Category 1 - Attribute Class Mappings

A.6.1.1 Level 1 Description: Record Set Mapping  
Base data: model\_name, ec\_name, tag\_name  
Attribute data: pref\_no, db\_name, set\_id,  
auc\_value

A.6.1.2 Level 2 Description: Data Field Mapping  
Base data: model\_name, ec\_name, tag\_name  
Attribute data: pref\_no, db\_name, rt\_id,  
df\_id

A.6.1.3 Level 3 Description: Complex Mapping  
Base data: model\_name, ec\_name, tag\_name  
Attribute data: pref\_no, mod\_id, parm\_name,  
db\_name, rt\_id

### A.6.2.1 Category 2 - Relation Class Mapping

A.6.2.1 Level 1 Description: Relation - Record Set Mapping  
Base data: model\_name, ec\_name, rc\_name  
Attribute data: ec\_name(dep), db\_name, set\_id,  
rt\_id\_of\_member

### A.6.3.1 Category 3 - Entity Class Mappings

A.6.3.1 Level 1 Description: Partition Mapping  
Base data: model\_name, ec\_name  
Attribute data: hp\_no, db\_name, rt\_id

A.6.3.2 Level 2 Description: Entity Class - Record Type -  
Union Discriminator  
Base data: model\_name, ec\_name  
Attribute data: db\_name, rt\_id, df\_id,  
comparison\_op, union\_value